

U.S. Patent Application Serial No. 10/541,308
Amendment filed April 29, 2009
Reply to OA dated November 3, 2008

AMENDMENTS TO THE CLAIMS:

Please amend claims 1, 2, 5 and 6, as follows. This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently amended): A method of manufacturing an iron-based sintered alloy member having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, and the balance of Fe and inevitable impurities,

the method comprising:

formulating an Fe powder, a graphite powder and a Cu alloy powder, as raw powders;

mixing the powders to form a powder mixture; and

forming the powder mixture into a green compact and sintering the green compact in a hydrogen atmosphere containing nitrogen at a temperature of 1090 to 1300°C;

wherein the Cu alloy powder has a composition consisting of 1 to 10% by mass of Fe, 0.2 to 1% by mass of oxygen, and the balance of Cu and inevitable impurities.

Claim 2 (Currently amended): A method of manufacturing an iron-based sintered alloy member having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, 0.0025 to 1.05% by mass of Mn and/or 0.001 to 0.7% by mass of Zn, and the balance of Fe and inevitable impurities,

U.S. Patent Application Serial No. 10/541,308
Amendment filed April 29, 2009
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the method comprising:

formulating an Fe powder, a graphite powder and a Cu alloy powder, as raw powders;

mixing the powders to form a powder mixture;

forming the powder mixture into a green compact and sintering the green compact in a hydrogen atmosphere containing nitrogen at a temperature of 1090 to 1300°C,

wherein the Cu alloy powder has a composition consisting of 1 to 10% by mass of Fe, 0.2 to 1% by mass of oxygen, 0.5 to 15% by mass of Mn and/or 0.2 to 10% by mass of Zn, and the balance of Cu and inevitable impurities.

Claims 3-4 (canceled).

Claim 5 (Currently amended): A method of manufacturing an iron-based sintered alloy member having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, 0.001 to 0.14% by mass in total of at least one selected from the group consisting of Al and Si, and the balance of Fe and inevitable impurities,

the method comprising:

formulating an Fe powder, a graphite powder and a Cu alloy powder, as raw powders;

mixing the powders to form a powder mixture; and

forming the powder mixture into a green compact and sintering the green compact in a hydrogen atmosphere containing nitrogen at a temperature of 1090 to 1300°C,

U.S. Patent Application Serial No. 10/541,308

Amendment filed April 29, 2009

Reply to OA dated November 3, 2008

wherein the Cu alloy powder has a composition consisting of 1 to 10% by mass of Fe, 0.2 to 1% by mass of oxygen, 0.01 to 2% by mass in total of at least one selected from the group consisting of Al and Si, and the balance of Cu and inevitable impurities.

Claim 6 (Currently amended): A method of manufacturing an iron-based sintered alloy member having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, 0.0025 to 1.05% by mass of Mn and/or 0.001 to 0.7% by mass of Zn, 0.001 to 0.14% by mass in total of at least one selected from the group consisting of Al and Si, and the balance of Fe and inevitable impurities,

the method comprising:

formulating an Fe powder, a graphite powder and a Cu alloy powder, as raw powders;

mixing the powders to form a powder mixture; and

forming the powder mixture into a green compact and sintering the green compact in a hydrogen atmosphere containing nitrogen at a temperature of 1090 to 1300°C,

wherein the Cu alloy powder has a composition consisting of 1 to 10% by mass of Fe, 0.2 to 1% by mass of oxygen, 0.5 to 15% by mass of Mn and/or 0.2 to 10% by mass of Zn, 0.01 to 2% by mass in total of at least one selected from the group consisting of Al and Si, and the balance of Cu and inevitable impurities.

Claims 7-8 (canceled).

U.S. Patent Application Serial No. 10/541,308
Amendment filed April 29, 2009
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Claim 9 (Previously presented): The method of manufacturing the iron-based sintered alloy member according to claim 1, wherein the Fe powder, the graphite powder and the Cu alloy powder are formulated so that the content of the graphite powder is from 0.1 to 1.2% by mass, the content of the Cu alloy powder is from 1 to 7% by mass, and the balance is composed of the Fe powder.

Claim 10 (Withdrawn): An oil pump rotor made of an iron-based sintered alloy, comprising an iron-based sintered alloy having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, and the balance of Fe and inevitable impurities.

Claim 11 (Withdrawn): An oil pump rotor made of an iron-based sintered alloy, comprising an iron-based sintered alloy having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, 0.0025 to 1.05% by mass of Mn and/or 0.001 to 0.7% by mass of Zn, and the balance of Fe and inevitable impurities.

Claims 12-13 (canceled).

Claim 14 (Withdrawn): An oil pump rotor made of an iron-based sintered alloy, comprising an iron-based sintered alloy having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to

U.S. Patent Application Serial No. 10/541,308
Amendment filed April 29, 2009
Reply to OA dated November 3, 2008

0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, 0.001 to 0.14% by mass in total of at least one selected from the group consisting of Al and Si, and the balance of Fe and inevitable impurities.

Claim 15 (Withdrawn): An oil pump rotor made of an iron-based sintered alloy, comprising an iron-based sintered alloy having a composition consisting of 0.5 to 7% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, 0.0025 to 1.05% by mass of Mn and/or 0.001 to 0.7% by mass of Zn, 0.001 to 0.14% by mass in total of at least one selected from the group consisting of Al and Si, and the balance of Fe and inevitable impurities.

Claims 16-17 (canceled).

Claim 18 (Withdrawn): The oil pump rotor according to claim 10, wherein the iron-based sintered alloy has such a texture that base material cells containing Fe, as a main component, Cu and O, which are partitioned with an old Fe powder boundary formed by sintering the Fe powder, as raw powders, are aggregated to form a basis material and the base material cells partitioned with the old Fe powder boundary have such a gradient concentration that the concentration of Cu and O in the vicinity of the old Fe powder boundary is higher than the concentration of Cu and O of the center portion of the base material cell.

U.S. Patent Application Serial No. 10/541,308
Amendment filed April 29, 2009
Reply to OA dated November 3, 2008

Claim 19 (Withdrawn): An iron-based sintered alloy which has a composition consisting of 0.5 to 10% by mass of Cu, 0.1 to 0.98% by mass of C, 0.02 to 0.3% by mass of oxygen, and the balance of Fe and inevitable impurities, and also has a texture composed of an aggregate of base material cells made of an Fe-based alloy containing C, Cu and O, which are partitioned with an old Fe powder boundary formed by sintering an Fe powder, as raw powders, wherein the base material cells made of the Fe-based alloy containing C, Cu and O, which are partitioned with the old Fe powder boundary, have such a gradient concentration that the concentration of Cu and O in the vicinity of the old Fe powder boundary is higher than the concentration of Cu and O of the center portion of the base material cell.

Claim 20 (Withdrawn): The iron-based sintered alloy according to claim 19, wherein the base material cells made of the Fe-based alloy containing C, Cu and O, which are partitioned with the old Fe powder boundary, have such a gradient concentration that the concentration of Cu and O is maximum in the vicinity of the old Fe powder boundary, while the concentration of Cu and O decreases toward the center portion of the base material cell and reached a minimum value at the center of the base material cell.

Claim 21 (Withdrawn): A method of manufacturing the iron-based sintered alloy member of claim 19, which comprises formulating an Fe powder, a graphite powder and a Cu alloy powder having a composition consisting of 1 to 10% by mass of Fe, 0.2 to 1% by mass of oxygen, and the

U.S. Patent Application Serial No. 10/541,308
Amendment filed April 29, 2009
Reply to OA dated November 3, 2008

balance of Cu and inevitable impurities, mixing the powders to form a powder mixture, press-forming the powder mixture into a green compact and sintering the green compact in a hydrogen atmosphere containing nitrogen at a temperature of 1090 to 1300°C.

Claim 22 (Previously presented): The method of manufacturing the iron-based sintered alloy member according to claim 2, wherein the Fe powder, the graphite powder and the Cu alloy powder are formulated so that the content of the graphite powder is from 0.1 to 1.2% by mass, the content of the Cu alloy powder is from 1 to 7% by mass, and the balance is composed of the Fe powder.

Claim 23 (Previously presented): The method of manufacturing the iron-based sintered alloy member according to claim 5, wherein the Fe powder, the graphite powder and the Cu alloy powder are formulated so that the content of the graphite powder is from 0.1 to 1.2% by mass, the content of the Cu alloy powder is from 1 to 7% by mass, and the balance is composed of the Fe powder.

Claim 24 (Previously presented): The method of manufacturing the iron-based sintered alloy member according to claim 6, wherein the Fe powder, the graphite powder and the Cu alloy powder are formulated so that the content of the graphite powder is from 0.1 to 1.2% by mass, the content of the Cu alloy powder is from 1 to 7% by mass, and the balance is composed of the Fe powder.

U.S. Patent Application Serial No. 10/541,308
Amendment filed April 29, 2009
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Claim 25 (Withdrawn): The oil pump rotor according to claim 11, wherein the iron-based sintered alloy has such a texture that base material cells containing Fe, as a main component, Cu and O, which are partitioned with an old Fe powder boundary formed by sintering the Fe powder, as raw powders, are aggregated to form a basis material and the base material cells partitioned with the old Fe powder boundary have such a gradient concentration that the concentration of Cu and O in the vicinity of the old Fe powder boundary is higher than the concentration of Cu and O of the center portion of the base material cell.

Claim 26 (Withdrawn): The oil pump rotor according to claim 14, wherein the iron-based sintered alloy has such a texture that base material cells containing Fe, as a main component, Cu and O, which are partitioned with an old Fe powder boundary formed by sintering the Fe powder, as raw powders, are aggregated to form a basis material and the base material cells partitioned with the old Fe powder boundary have such a gradient concentration that the concentration of Cu and O in the vicinity of the old Fe powder boundary is higher than the concentration of Cu and O of the center portion of the base material cell.

Claim 27 (Withdrawn): The oil pump rotor according to claim 15, wherein the iron-based sintered alloy has such a texture that base material cells containing Fe, as a main component, Cu and O, which are partitioned with an old Fe powder boundary formed by sintering the Fe powder, as raw powders, are aggregated to form a basis material and the base material cells partitioned with the old Fe powder boundary have such a gradient concentration that the concentration of Cu and O in the

U.S. Patent Application Serial No. 10/541,308

Amendment filed April 29, 2009

Reply to OA dated November 3, 2008

vicinity of the old Fe powder boundary is higher than the concentration of Cu and O of the center portion of the base material cell.